

## Abandoned Mines as Bat Habitat

Over the last decade, an increasing concern about liability by private and public land owners, as well as federal and state agencies, has prompted an exponential increase in the efforts to safeguard abandoned mines. Abandoned mines have long been recognized as habitat for a large number of bat species as well as other kinds of wildlife. Since safeguarding typically involves destruction by blasting or backfilling, this has stimulated growing interest in their potential for wildlife habitat. Although a systematic program of evaluation of abandoned mines prior to closure has been slow to implement, enough mines have been surveyed to illustrate that they are a significant habitat resource for bats of several species. Of the thousands of abandoned mines in the West which have been surveyed over the last ten years, roughly half have shown some type of use by bats and about 10% have shown some form of significant use. The difficult question of what constitutes significant use has been addressed by Altenbach and Milford (1995), Altenbach and Pierson (1995), Tuttle and Taylor (1994), and others. Use by maternity colonies of any kind, use for large hibernating colonies, use as a migratory stopover, and use for colonial reproductive behavior are relatively clear examples. Prudence dictates that any kind of use that is previously undocumented qualifies as well. Significance of use varies regionally and is generally best determined by the best judgment of bat biologists familiar with the region.

Large numbers of underground mines were not a common feature of the environment in the western United States until a few decades before the dawn of the 20th century. Why should any effort be made to protect a habitat, especially one that presents a potential hazard to humans, that did not exist until recent times? By the same reasoning, we should not need wildlife preserves or national parks. Many bat species are in decline as a direct or indirect result of human activity. A significant part of this decline can be attributed to

destruction of natural roost sites or human disturbance at roost sites. Species such as Townsend's big-eared bat are notorious for establishing maternity colonies in relatively exposed parts of caves and rock shelters. Equally notorious is their habit of abandoning a roost site, and their newborn young as well, because of a relatively slight disturbance. Recreational activities, although perhaps inadvertent, have had a strong negative impact on a number of bat species. Roost habitat destruction because of encroaching development, logging of old growth forests, and renewed mining have also taken a toll. Oddly enough, the micro-habitat presented by concavities in "snag" trees is duplicated by the micro-habitat provided in some abandoned mines.

Twenty-eight of the 45 species of bats found in the continental United States are known to roost in underground mines. In California, the only known colonies of the Cave myotis, all of the winter and most of the summer roosts of the California leaf-nosed bat, and roughly one third of all Townsend's big eared bat roosts are in abandoned mines (Altenbach and Pierson 1995). All of the known maternity colonies of the endangered Lesser long-nosed bat in the United States

are in abandoned mines (V. M. Dalton, pers. comm.), as are the majority of maternity and hibernating colonies of Townsend's big-eared bats in New Mexico. Abandoned mines provide a refugium in the face of loss of natural habitat. They can be likened to "Noah's Arks" which may allow some bat species to survive in the face of continuing disturbance at natural roost sites. Simultaneous safeguarding and protection of a small number of abandoned mines with bat-compatible closures or "bat gates" promises to buy some time and allow more informed decisions to be made about their long term survival. Hopefully, natural roost sites can be protected although it seems quite possible that protected abandoned mines could easily be the primary roost habitat for some of these species.

Nevada's mine closure program illustrates the potential for impact that abandoned mine clo-

*Townsend's big-eared bat, *Corynorhinus townsendii*, is the most common resident in abandoned mines in many regions of the west. It uses mines for maternity activity, bachelor colonies, mating, and hibernation.*



sure can have on bat populations. Before state personnel were aware of the bat habitat potential of abandoned mines, the Nevada Abandoned Mine Lands Bureau closed or facilitated the closure of roughly 3,000 mine features without any type of wildlife survey. If we conservatively estimate that 5% of Nevada's abandoned mines had significant bat use, then roughly 150 mines with significant bat use, and probably in some cases with the bats in them, were destroyed by backfilling. Even though abandoned mines are a patchy feature of the environment, hundreds of thousands of them are scattered over the western states. When the impact of the Nevada mine closure program is extrapolated regionally, the potential for extreme negative impact to bat populations is easily seen.

#### *Evaluation of the Resource*

Bat surveys in anticipation of abandoned mine closures vary from thorough to non-existent. They depend upon whether the entities doing the closure are public or private, whether the personnel involved have even heard that mines are used by bats and that bats may be worthy creatures to protect, whether money is available to do surveys and construct bat-compatible closures, as well as the general vagaries of human nature. Although mine closure programs using federal monies are mandated by National Environmental Policy Act regulations to evaluate mine features for wildlife habitat, those using state or private dollars generally are not. For example, a state-based Abandoned Mine Lands Program funded by the mining industry is not subject to federal guidelines. At a 1994 public meeting, representatives from a mining company stated with some pride and enthusiasm that they would backfill every abandoned mine on their property without considering possible wildlife use and there was nothing anyone could do about it. In contrast, other mining companies have gone out of their way trying to do the right thing.

A program to evaluate abandoned mines for significant bat use first requires the education of the private and governmental entities involved with mine closure. The bat habitat-abandoned mine workshops organized by Bat Conservation International, in partnership with corporate, state and federal agencies, have informed numerous individuals and companies about the problem and some of the solutions to it. Some of the best success stories, i.e., mines with significant bat populations safeguarded with bat-compatible closures, have occurred because informed people were aware of the importance of the issue and took appropriate actions. Since there are not unlimited funds to protect abandoned mines as bat resources, protection first requires careful evaluation of the resource.

Although bat biologists continue to learn more about the diverse factors which make abandoned mines suitable for bat habitat, we have not yet reached a level of understanding that allows evaluation of specific bat use, or even the potential for use, without a careful examination of the actual mine in question.

Bat surveys of abandoned mines can be internal (underground), external, or a combination of both. External surveys are time consuming, labor intensive, require specialized equipment and training, and require considerable knowledge of abandoned mines and especially the bats that use them. Although this approach can detect warm season use, it is useless for detecting hibernation, especially if small numbers of bats are present. If a mine cannot be fully evaluated because portions of its workings are inaccessible or because entry presents unacceptable risks, an external evaluation is the only option. In practice, a combination of underground and external evaluation is generally necessary.

Internal surveys are the least labor intensive and most effective means to survey abandoned mines for bat use. However, this procedure requires personnel who are underground-trained and experienced, properly equipped, and experienced in bat biology. Unfortunately, there are many individuals attempting to do internal abandoned mine surveys, who fail to meet the qualifications for underground survey and who pose safety risks to themselves and others.

It is essential, therefore, to continue efforts to increase awareness about both the potential shortcomings of current mine evaluations and the actual complexity of historic mining operations. Training for external evaluation has been part of the ongoing bat habitat-abandoned mine workshops, but that training is very generalized. Underground training has been nonexistent, partially because of liability-related concerns on the part of those who would do the training. Although Mine Safety and Health Administration training and certification is a prerequisite for anyone doing underground surveys, it is primarily intended for individuals working in active mines. As such, the program does not include information concerning some of the most common hazards associated with inactive mines, e.g., the kinds of pertinent gas detection apparatus and their limitations, or how to recognize old explosives. Implementing comprehensive training programs would ensure competent researchers who were able to effectively evaluate bat use in abandoned mines. Correcting these education-related deficiencies would go a long way to ensuring that historic mines would be properly evaluated prior to proposed closure programs.

### Bat-Compatible Closures

If survey data reveal that a mine is used by bats and if the use is significant, the mine would be an ideal candidate for protection with a bat-compatible closure that precludes public access, but allows bats to use the site. However, the decision to install a bat-compatible closure depends upon a variety of other factors. Appropriate questions to consider include: Are alternative features, used in the same way, nearby? How feasible is a bat-compatible closure for a particular mine entry? Will preservation of an abandoned roost provide habitat or mitigate habitat destruction elsewhere?

The bat-compatible closures used by the New Mexico Abandoned Mined Lands Program are designed by staff engineers and are similar to the designs preferred by the American Cave

Conservation Association. Current designs, generally constructed with crossbars of heavy angle iron reinforced with stiffeners, are difficult for vandals to breach. Tuttle and Taylor (1994) and Dalton and Dalton (1995) summarize design details; the American Cave Conservation Association is a further source for gate designs. Of the many hundreds of bat-compatible gates installed

in the United States, relatively few have been breached by vandals. In New Mexico, the percentage of breached gates is lower than the percentage of failures for non-bat-compatible closures. All types of mine closures must be monitored for possible failure. A mine cannot be closed and then forgotten.

#### Timing of Mine Closure

The selection of an appropriate "time window" for permanent sealing or safely installing a non-bat-compatible closure must minimize the possibility that known or unknown resident bat species will be trapped inside. Installation of bat-compatible closures must likewise be timed to minimize disturbance of residents. Timing will vary with the type of use, the species present and the region. Closure activities need to be explicitly coordinated with local bat biologists.

#### Conclusion

We know that abandoned mines are important habitat, in some cases vital habitat, for a large number of bat species. We know how to survey

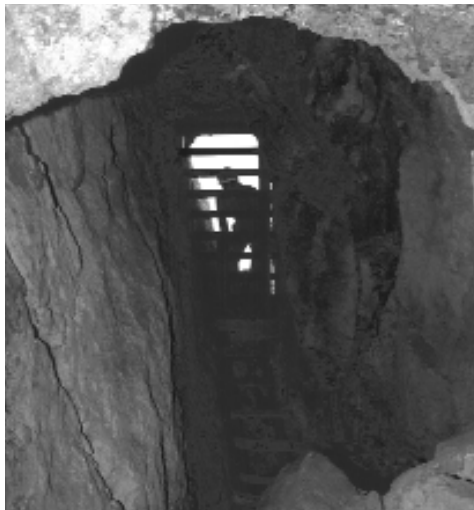
mines for bat use and we have a good idea what constitutes significant use. We have considerable experience with designing bat-compatible closures, we know how bats deal with them, and we know their installation can result in increased bat use within protected mines. We know that bat-compatible closures can be defeated by vandals, but this becomes less likely as designs improve. We know that bat-compatible closures have to be monitored just like any other mine closure. If we can continue to learn and apply what we know, several bat species, currently in serious jeopardy, will have an improved chance of survival well into the next century.

### References

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Anyone wanting to learn more about the bat habitat-mines program should contact the Bats and Abandoned Mine Project, Bat Conservation International, P.O. Box 162603, Austin, Texas 78716, (telephone 512-327-9721).



*A bat-compatible closure or "bat gate" at one of the adit entrances of an abandoned manganese mine in New Mexico. The gate blocks human entry but lets the three species of bats that use the mine come and go freely.*